LETTERS TO THE EDITOR.

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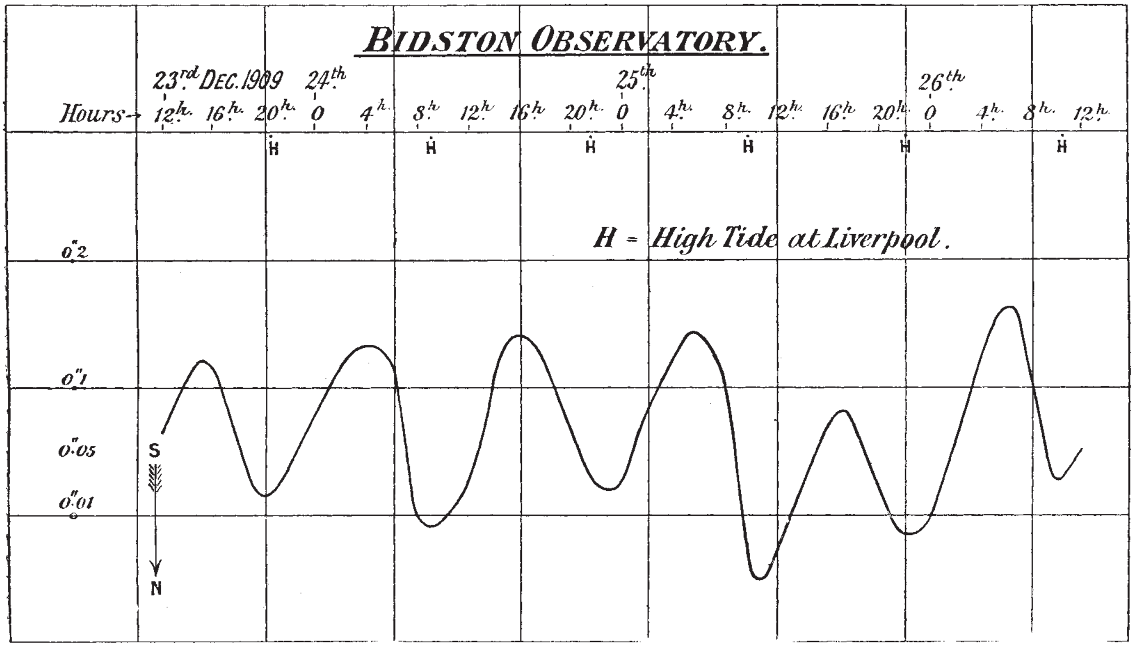
Surface Deformation and the Tides.

FOUR years ago I installed in a cellar beneath the Victoria Club, at Ryde, an astronomical level. It was oriented at right angles to the shore-line, only a few yards distant. At the time of high water I found, contrary to my expectation, that the strand, rather than sinking, rose upwards. This I attributed to the tide backing up underground drainage beneath the land, which in consequence bulged upwards. Sir George Darwin, however, makes the suggestion that my observations might be explained on the assumption that the load of water in the English Channel on the south of the Isle of Wight might reverse the effect of a smaller body of water in the Solent on the north side.

I was enabled to make a second attempt to measure the changing slope along a coast in consequence of tidal influences through the kind cooperation of Mr. W. E. Plummer, the director of the Bidston Observatory. This observatory is situated near Birkenhead, about one and a half miles from the sea. The instrument is a slightly modified form of a British Association type of seismograph. It consists of a horizontal boom, 2 feet in length, carrying a weight of 6 lb. At the outer end of the boom there is an extremely light lever, which multiplies the movement of the boom eight times. This, which is a peculiar feature of the apparatus, was designed by my assistant, Mr. Shinobu Hirota. The outer end of this pointer moves above a surface of bromide paper driven by clockwork. A displacement of the image shown on the paper through a distance of 1 mm. corresponds to the displacement which would be obtained were the stand of the pendulum tilted through an angle of 0·08″. The objects of this installation are two-fold, first, to record tidal effects, and, secondly, to pick up minute movements which other types of seismograph seldom record. The accompanying figure shows the tidal effect, which varies with the height of the water, the ebb, and the flow.



The movement of a Horizontal Pendulum at Bidston, December 23–6, 1909. The bob moves to the North with a rising tide. Scale $\frac{1}{15}$ in. = 0·01 second of arc.

At high tide the bed of the Irish Sea is depressed, and the steepness of the bounding shores is increased. The buildings in towns along sea-boards twice a day are tilted seawards. When the tide flows out these movements are reversed. The deflection of the pendulum by tidal load and attraction, although greater than might be expected, is, however, very small. At Bidston it is about 0·2″, or 1 inch in sixteen miles.

JOHN MILNE.

Shide, Isle of Wight, January 24.

A Possible Identification of Comet 1909*e*.

HERR EBELL has recently determined approximate elliptic elements for this comet.

These elements bear some resemblance to those of comet 1890 VII. Spitaler, which has a period of 6·373 ± 0·01 years, and has not been seen again.

Comet Spitaler had a perihelion distance of 1·8 and an aphelion distance of 5·1. It passes near no other planets than Mars and Jupiter. The small mass of Mars makes the perturbations by that planet of little account.

As comet Spitaler's period is half that of Jupiter, it only approaches Jupiter at alternate aphelion passages. It did not approach Jupiter at its aphelion after its appearance in 1890, but it did approach Jupiter on the following aphelion passage, 1899–1900.

The comet's motion is direct, and it therefore remains in proximity to Jupiter for a considerable time. Its closest approach took place about 1899 November 8, when its distance was about 0·6 and its eccentric anomaly 160°. For more than a year it remained within a distance 0·8 of Jupiter, and the perturbations must have been considerable. If we carry Ebell's orbit backwards, we see that comet 1909*e* was also near Jupiter in 1899–1900, and there is, therefore, a fair probability of the two comets being the same.

If Ebell's elements were definitive, this identification would have to be given up, for a rough calculation shows that the changes of elements are not in the right direction or of the right magnitude. Ebell's elements, however, merely represent the first attempt to get elliptic elements instead of parabolic elements. They depend on three places only, the first and last being six weeks apart. Herr Ebell himself tells us that the residuals for a fourth observation in the middle of the above-mentioned six weeks amount to a minute of arc, so that it is quite conceivable that the

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errors of the elements are of the same order as the perturbations by Jupiter.

These perturbations by Jupiter depend upon the exact circumstances of the approach to Jupiter, and these circumstances in their turn may be largely modified by changes in the elements quite small enough to be consistent with the three months' observations in 1889–90. There is, therefore, great uncertainty as to where comet Spitaler should now be, and also some uncertainty as to what are the true elements of comet 1909*e*.

Identity is therefore very far from certain. The excuse for putting forward the present conjecture is the interest that naturally turns upon the question of what becomes of the short-period comets that are only once seen.

P. H. COWELL.

Pleochroic Halos.

IN a recent reference to the subject of pleochroic halos (*Phil. Mag.*, February, 1910) I stated that the outer edge of a corona might present an appearance suggesting an actual accentuation or deepening of the coloration, in accordance with the fact observed by Bragg and others that the ionisation of the α ray increased just before the limits of its ionising range was attained. For certain stages of development of the halo, this observation I have more recently confirmed beyond doubt. Like other structural particulars referred to in my paper, this too becomes obliterated by over-exposure. In one case (in the lithia mica of Zinnwald) a stage of development has been found in which the extreme outer border of the corona is the sole visible part of that structure, the appearance presented being that of a detached, very delicate, ring of perfect regularity surrounding the central halo, a space showing no definitely visible ionisation intervening. The outer ring has a radius of 0·0344 mm., and the inner halo a radius of 0·0191 mm. The outer ring is of about normal radial dimensions; the inner radius is that corresponding to under-exposure to the slower moving α particles. Reference to Bragg's curves (*Phil. Mag.*, September, 1905) will more fully explain.

In the granite of Ochsenkopf, Fichtelgebirge, complex halos will be found very beautifully developed. Some of these conform to dimensions such as might be referred to the α radiations of thorium and its derivatives, others to those of the radium family.

The halos described in my paper, referred to above, are for the most part in a lithia-bearing mica, of a kind which is not correctly included among the Muscovites. The emendation does not, however, notably affect the calculations given. The careful observation of the dimensions of pleochroic halos will, I think, be found of service in distinguishing certain micas—the Biotites from the Muscovites, for instance.

J. JOLY.

Trinity College, Dublin, January 31.

Dangerous Lecture Experiments.

THE explosion referred to by Mr. Power in NATURE of February 3 (p. 399) was probably due to the presence of a trace of moisture in the reacting substances. I had a similar alarming experience some years ago, using precipitated silica without specially drying it.

Moissan ("Traité de Chimie Minèrale," ii., 389), referring to a paper by Ludwig Gattermann (*Ber.*, xxii., 186, 1889), states:—"La réaction ($SiO_2 + 2Mg = Si + 2MgO$) est si violente, d'après cet auteur, que si l'on emploie la silice précipitée, le tube de verre est entièrement déformé, et une partie le la matière est projetée sous forme d'une gerbe de feu." Winkler (*Ber.*, xxiii., 2652, 1890) found that 0·2 gram of a mixture of magnesium and silica in the above proportions heated in a tube closed at one end caused explosion and shattering of the tube. Vigoroux (*Annales de Chimie et de Physique*, xii., 153, 1897) recognised that the explosion is due to incomplete desiccation of the reacting materials.

Few text-books point out the necessity for ensuring the absence of moisture, although most of them point out that the reaction is very rapid and violent. The only book besides Moissan's "Traité" that I have found to give the warning is by an American, Dr. Benedict ("Chemical Lecture Experiments," The Macmillan Company, New York, 1901). Dr. Benedict insists upon the absence of moisture, but does not mention any reason.

This is not the only case in which dangerous experiments have been described and copied from one text-book to another. The collection of hydrogen from the action of sodium upon water is a case in point. Many books describe, with a diagram, the "drowning" of a piece of sodium by means of a special instrument of wire gauze. This *may* be carried out safely in some instances, but, as Newth points out, it is liable to be dangerous. Upon one occasion in my own experience, using a small piece of sodium, an earthenware pneumatic trough was shattered as well as the gas jar used to collect the hydrogen.

It would seem desirable that writers of text-books should obtain some personal knowledge of the experiments they recommend, as young teachers, relying upon the instructions given, might easily cause very dangerous accidents. In neither of the cases cited above would a chemist, unless fairly experienced, be likely to apprehend any difficulty or danger.

E. R. MARLE.

Hartley University College, Southampton.

THE letter of Mr. Power in NATURE of February 3 directs attention to a danger common to the use of any of the metallic reducing agents, and, although well known to a few for many years, it is not at all generally recognised. Even the well-known reaction

$$Fe_2O_3 + 2Al = Al_2O_3 + 2Fe,$$

if performed in the way described, is positively dangerous unless all the precaution necessary for a violent explosion be taken.

A very striking lecture experiment is to charge a tiny steel crucible that will contain about one-half up to one cubic centimetre of a mixture of ferric oxide and finely powdered aluminium, and to cover it loosely with a thin sheet-iron cover so as to preserve the contents from water vapour, and then to heat this up in a little furnace made of strong iron gauze covered with asbestos and held rigidly in a retort stand. An ordinary blow-pipe with a foot blower will be sufficient, and the reaction is so violent, as soon as the necessary temperature is attained, that in nearly every case the steel crucible will be shattered into pieces, notwithstanding the lightness of the cover.

The possibly dangerous character of the reduction was noticed by me certainly so long ago as 1896 whilst preparing special qualities of iron experimentally in the South Kensington laboratories, and shown to many persons. Even then it may have been not unknown to other workers with metals, although new to us; and although the mixture was at once respected, and absorbents of heat were used in the charge to moderate the action, I am aware of at least one narrow escape by an operator who wished to verify the observation and used a quarter of a kilogram of the mixture in a crucible heated by a Fletcher oxygen injector furnace, the pieces of which were thrown all over a large room, fortunately without striking any person.

The explanation is simply that the preliminary heating to the temperature of reaction is sufficient to enable the mixture to reach the volatilisation point of the iron by the heat suddenly evolved throughout the mass, and thus there is practically detonation; but it also suggests that some danger of explosion exists should a store of the mixture be involved in a fire, and these mixtures are now in fairly common use industrially.

HENRY C. JENKINS.

The School of Metalliferous Mining (Cornwall),
Camborne, February 5.

The Maintenance of Forced Oscillations.

PLEASE permit me to add a few words to my note on "The Maintenance of Forced Oscillations of a New Type," which appeared in NATURE of December 9, 1909. I stated that when a vibrating fork maintains the vibration of a string by periodically varying its tension, the stationary oscillation maintained may have a frequency of half of, equal to, 3/2 times, twice, &c., of that of the fork, each term in the harmonic series appearing separately by itself, or with one or more of the others conjointly, according to circumstances.

When two or more of the harmonics thus appear con-

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